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ABSTRACT

The purpose of the Exemplary Practice in Science and Mathematics Education (EPSME) study was to identify high quality science and mathematics teaching, to document exemplary practice through case studies, and to investigate key characteristics common to exemplary teaching in different sites. As one aspect of the overall project, students' perceptions of classroom psychosocial environment in classes taught by exemplary teachers were used in investigating any systematic differences between the classroom environments of exemplary and ordinary teachers. This paper includes: (1) a description of the EPSME project; (2) a description of the instruments used to assess classroom environment; and (3) a discussion of salient findings concerning the classroom environments of exemplary elementary science teachers and an exemplary high school biology teacher. These findings suggest that exemplary and ordinary science teachers can be differentiated in terms of the psychosocial environments of their classrooms. (JN)

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PSYCHOSOCIAL ENVIRONMENT IN CLASSROOMS OF EXEMPLARY SCIENCE TEACHERS

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Paper presented as part of symposium entitled "Exemplary Practice in Science Classrooms" at Annual Meeting of National Association for Research in Science Teaching, San Francisco, March 1986

This paper forms part of a four-paper symposium based on the Exemplary Practice in Science and Mathematics Education project conducted in Western Australia. As one aspect of the overall project, students' perceptions of classroom psychosocial environment in classes taught by exemplary teachers were used in investigating any systematic differences between the classroom environments of exemplary and ordinary teachers. Discussion in this paper is divided into three sections, namely, (1) the Exemplary Practice in Science and Mathematics Education project, (2) the instruments used to assess classroom environment, and (3) salient findings concerning the classroom environments of exemplary science teachers.

BACKGROUND TO EXEMPLARY PRACTICE PROJECT

As the first paper in this symposium (Tobin, 1986) provides a detailed account of the project's rationale and background, only a few brief details are included here. The basic purpose of the project was to identify high-quality science and mathematics teaching in elementary and high schools in Western Australia, to document exemplary practice through case studies, and to investigate key characteristics common to exemplary teaching at different sites. The project, therefore, bears similarities with the Search for Excellence project in the USA, although the Australian study had a stronger research element in that it attempted to draw some generalizations about common characteristics which distinguish exemplary and ordinary teachers. Because practices found to be exemplary in one situation might not necessarily produce the same set of results in a different setting, the study sought to identify a number of models which take account of differing views of exemplary practice and recognize the importance of contextual variables in determining the effectiveness of teaching and learning.

By focussing on exemplary practice, this project differs from much past research which has produced depressing results which highlight mediocre teaching and problems in science teaching. The project, therefore, is likely to contribute to improvement in the quality of science teaching through emphasizing effective practices which can serve as models for other teachers.

The study relied mainly on qualitative data collection methods, such as classroom observation and interviewing of students and teachers. The project's main product will be a set of case studies of exemplary science and mathematics teaching at approximately a dozen sites. However, the study also had a quantitative component based on the administration of questionnaire for various purposes. In particular, some instruments assessing psychosocial aspects of the classroom learning environment were administered to obtain student perceptions of any systematic differences in the climate of classes taught by exemplary and ordinary teachers.

ASSESSING CLASSROOM ENVIRONMENT WITH SHORT FORMS OF CES AND MCI

The field of classroom environment and a range of measuring instruments are reviewed comprehensively in various sources (Moos, 1979; Walberg, 1979; Fraser, 1981, 1985, 1986; Chavez, 1984). In this paper, which reports information about the classroom environments created by exemplary science teachers, use was made of short forms of the Classroom

Environment Scale (CES) and the My Class Inventory (MCI). The different subsections below consider (1) the original long form of each instrument, (2) development of the short forms, (3) hand scoring of the short forms and (4) validation of the short forms.

Long Form of CES and MCI

The initial development of the CES grew out of Moos's program of research in a variety of human environments including hospital wards, therapy groups, military companies, university residences, and work settings (Moos, 1974). The published version of the CES (Trickett & Moos, 1973; Moos & Trickett, 1974) consists of 10 items of true-false response format assessing each of nine dimensions (Involvement, Affiliation, Teacher Support, Task Orientation, Competition, Order and Organization, Rule Clarity, Teacher Control and Innovation). Fisher and Fraser's (1983a) use of the CES among a large sample of science classrooms attested to each scale's internal consistancy reliability, discriminant validity and ability to differentiate between the perceptions of students in different classrooms. In addition to an actual (or real) form, the CES also has a preferred (or ideal) form. The preferred form is concerned with goals and value orientations as it measures perceptions of the environment ideally liked or preferred.

The CES has been used as a source of predictor and criterion variables in a variety of studies conducted in the United States and Australia. Use of CES dimensions as predictor variables has established relationships between the nature of the classroom environment and science students' achievement on several inquiry skills and science-related attitudes (Fraser & Fisher, 1982a). In studies which have used the actual version of the CES as a source of criterion variables, Trickett (1978) reported differences between five types of public schools (urban, rural, suburban, vocational and alternative); Evans and Lovell (1979) reported differences among classes following alternative educational programs or innovations; Trickett, Trickett, Castro and Schaffner (1982) found differences between single-sex and coeducational schools; and Harty and Hassan (1983) reported differences between the classes of Sudanese teachers with different student control ideologies. In studies which made use of both the actual and preferred versions of the CES in the same investigation, Fisher and Fraser (1983b) reported interesting systematic differences between students' and teachers' perceptions of actual and preferred classroom environment and Fraser and Fisher (1983a) found that students achieved better when there was a higher similarity between the actual classroom environment and that preferred by students.

The MCI is a simplification of the widely-used Learning Environment Inventory (LEI) (Fraser, Anderson, & Walberg, 1982). Whereas the LEI was designed originally for use in research with senior high school students, the MCI is suitable for elementary school children (and for junior high school students who might experience reading difficulties with the LEI). The MCI differs from the LEI in four important ways. First, in order to minimize fatigue among younger children, the MCI contains only five of the LEI's original 15 scales (Cohesiveness, Friction, Difficulty, Satisfaction and Competitiveness). Second, item wording has been simplified to enhance readability. Third, the LEI's four-point response format has been reduced to a two-point (Yes-No) response format. Fourth,

students answer on the questionnaire itself instead of on a separate response sheet to avoid errors in transferring answers from one place to another. The most recent version of the MCI contains 38 items (Fisher & Fraser, 1981; Fraser, Anderson, & Walberg, 1982).

Past research applications involving the long form of the MCI include studies of the effects of classroom environment on student achievement (Fraser & Fisher, 1982b; Fraser & O'Brien, 1985), curriculum evaluation studies (Talmage & Hart, 1977), differences between student and teacher perceptions of actual and preferred environment (Fraser, 1984), and the effects of grouping students in the laboratory according to formal reasoning ability (Lawrenz & Munch, 1984).

Short Forms of CES and MCI

Although the long forms of the CES and MCI have been used successfully for a variety of purposes, experience has shown that some researchers and teachers would prefer a more rapid assessment of classroom environment. Consequently, Fraser and Fisher (1983b) developed short forms of the CES and MCI to satisfy three main criteria. First, the number of items was reduced to provide greater economy in testing and scoring time. Second, because many teachers using these instruments do not have ready access to computerized scoring methods, the short forms were designed to be amenable to easy hand scoring. Third, although most existing classroom environment scales were developed to provide adequate reliability for the assessment of the perceptions of individual students, the majority of applications of these assessments involve averaging the perceptions of students within a class to obtain class means. Consequently, it was decided that the short forms should be developed to have adequate reliability for uses involving the assessment of class means, and that it would be recommended that the short forms only be used in applications in which the class mean is the unit of analysis.

The amount of reduction in the length of scales was guided simultaneously by the need to maintain adequate reliability for class means and by advice from teachers and researchers about the amount of testing time which would be preferable. The 38 items in the long form of the MCI's five scales were shortened to produce an instrument containing five 5-item scales (i.e., 25 items altogether). The long form of the CES containing nine 10-item scales was reduced to a short form consisting of six 4-item scales (i.e., 24 items altogether). Five of these six scales contained the identical four items to those in a short version of the CES recommended by Moos and Trickett (1984), while the sixth scale (namely, Task Orientation) was made up of two of the items in Moos and Trickett's version together with two different items.

The results of item analyses performed with large samples of students responding to the long forms of each instrument provided the main statistical criteria for selection of items for inclusion in the short forms. Internal consistency reliability of the short form of each scale was enhanced by removing items with smaller item-remainder correlations (i.e., correlations between item score and total score on the rest of that scale) and discriminant validity was enhanced by including only those items whose correlation with its own a priori assigned scale was larger than its correlation with any of the other items in the same

battery. The main logical criteria employed when shortening scales were that a preference was given to items with better face validity and that an attempt was made to maintain a balance (both within individual scales and within each instrument as a whole) of items with positive and negative scoring directions. However, because the long forms of some scales had an imbalance in the number of its items with positive and negative scoring directions, this imbalance tended to be maintained in the short forms. In the case of each of the three scales present in the long form of the CES but excluded in the short form, it was found that the 4-item version recommended by Moos and Trickett displayed unsatisfactorily low internal consistency reliability with the large sample of science classes.

In order to clarify the nature of the short forms of each instrument and to make them readily accessible to science teachers and science education researchers, a complete copy of the actual form of the CES and MCI is provided in Appendix A. Also Table I provides a scale description for each of the dimensions in the CES and MCI. Unlike the corresponding long form of each instrument, the short forms do not require a separate response sheet because all items and space for responding fit on a single page. Although item wording is almost identical in actual and preferred forms, words such as "would" are included in the preferred form to remind students that they are rating preferred rather than actual classroom environment. For example, the statement "Different students do different work" in the actual form of the ICEQ would be changed in the preferred form to "Different students would do different work".

Scoring Procedures

The short forms of each of the instruments have two features which facilitate easy hand scoring. First, underlining of an item number together with inclusion of R in the Teacher Use Only column identifies those items which need to be scored in the reverse direction. Second, items from the different scales are arranged in cyclic order so that all items from a particular scale are found in the same position in each block of items.

Appendix A illustrates how the short form of the CES is scored. Items not underlined and without the letter R are scored 3 for True and 1 for False. Underlined items with the letter R are scored in the reverse manner. Omitted or invalid responses are scored 2. To obtain scale totals, the four item scores for each scale are added. The first, second, third, fourth, fifth, and sixth items in each block of six, respectively, measures Involvement, Affiliation, Teacher Support, Task Orientation, Order and Organization, and Rule Clarity. Scale totals can be written in the spaces provided at the bottom of the questionnaire. Appendix A illustrates how these scoring procedures were used to obtain a total of 9 for the Involvement scale and a total of 7 for the Rule Clarity scale.

The method of hand scoring the short form of the MCI is also shown in Appendix A. Items not underlined and without R in the Teacher Use Only column are scored by allocating 3 for Yes and 1 for No. Underlined items with R are scored in the reverse manner. Omitted or invalidly answered items are scored 2. To obtain scale totals, the five item scores for each scale are added. The first, second, third, fourth, and fifth items

TABLE I

Scale Description for Each Dimension in Short Form of CES and MCI

Scale	Scale Description
Classroom Environment Scale (CES) (High School Level)	
Involvement	Extent to which students have attentive interest, participate in discussions, do additional work and enjoy the class
Affiliation	Extent to which students help each other, get to know each other easily and enjoy working together
Teacher Support	Extent which the teacher helps, befriends, trusts and is interested in students
Task Orientation	Extent to which it is important to complete activities planned and to stay on the subject matter
Order & Organization	Emphasis on students behaving in an orderly, quiet and polite manner, and on the overall organization of classroom activities
Rule Clarity	Emphasis on clear rules, on students knowing the consequences for breaking rules, and on the teacher dealing consistently with students who break rules
My Class Inventory (MCI) (Elementary School Level)	
Cohesiveness	Extent to which students know, lp and are friendly towards each other
Friction	Amount of tension and quarrelling among students
Difficulty	Extent to which students find difficulty with the work of the class
Satisfaction	Extent of enjoyment of class work
Competitiveness	Emphasis on students competing with each other

in each block of five, respectively, measures Satisfaction, Friction, Competitiveness, Difficulty, and Cohesiveness. For example, the total Satisfaction scale is obtained by adding scores for Items 1, 6, 11, 16, and 21. Scale totals can be recorded in the spaces provided at the bottom of the questionnaire. ~~See~~ Appendix A illustrates how these scoring procedures were used to obtain a total of 10 for Satisfaction and a total of 12 for Cohesiveness.

Validation

Table II provides statistical information about the short form of each scale based on the use of the class mean as the unit of analysis with data collected from large and representative samples of science classes. The actual and preferred forms of the CES were administered to a sample of 116 Grade 8 and 9 science classes in 33 different schools in Tasmania, Australia (Fraser & Fisher, 1983b). Data for the MCI are based on a sample of 758 Grade 3 students in 32 classes in 8 schools in an outer suburb of Sydney, Australia (see Fraser & O'Brien, 1985). As some reading difficulties were anticipated among some students in this sample, a research assistant visited each school to administer the scales orally. As no data on the correlation between long and short form were available for this sample, Table II reports the correlation between long and short form for the actual form only for a sample of 100 classes of Grade 7 science students in Tasmania, Australia. Each sample was made up of approximately equal numbers of boys and girls.

Data reported in Table II for the actual and preferred versions of instruments provide evidence in support of each short scale's concurrent validity (namely, the correlation between long and short forms), internal consistency (alpha reliability coefficient), discriminant validity (using the mean magnitude of the correlation of a scale with the other scales in the same instrument as a convenient index), and ability to differentiate between classrooms (ANOVA results) (Fraser & Fisher, 1983b; Fraser & O'Brien, 1985). The first two columns of figures in Table II show that the correlations between scale scores on the long form and the short form ranged from 0.78 to 0.97. These values, which do not incorporate a correction for attenuation to compensate for imperfect scale reliability, support the concurrent validity of the short forms. Table II also reports each short scale's internal consistency and discriminant validity (using the class as the unit of analysis). These data indicate that the reliability of a scale's short form is typically less than 0.1 smaller than the reliability of the corresponding long form (as reported in Fraser & Fisher, 1983b) and that the short forms generally have adequate reliability for applications involving class means. Table II also shows that the values of the mean correlation of a scale with the other scales in the same instrument are quite similar to those reported previously for the long forms of these scales. These values suggest that the short forms display adequate discriminant validity, and that both the short and long forms of scales in each instrument measure distinct although somewhat overlapping aspects of classroom environment.

A desirable characteristic of the actual form of any classroom environment scale which is to be used in applications involving the class mean as the unit of analysis is that it is capable of differentiating between the perceptions of students in different classes. This was explored for each short scale for the present samples by performing a

TABLE II

Concurrent Validity (Correlation with Long Form), Internal Consistency (Alpha Coefficient), Discriminant Validity (Mean Correlation with Other Scales), and ANOVA Results for Class Membership Differences for Short Forms of CES and MCI

Scale	Correl. with Long Form		Alpha Reli-ability		Mean Correl. with other Scales		ANOVA Results Eta^2
	Act.	Pref.	Act.	Pref.	Act.	Pref.	Actual
Classroom Environment Scale (CES) (High school level)							
Involvement	0.92	0.93	0.65	0.71	0.43	0.41	0.27*
Affiliation	0.78	0.79	0.64	0.60	0.29	0.31	0.20*
Teacher Support	0.92	0.87	0.78	0.65	0.41	0.35	0.31*
Task Orientation	0.80	0.78	0.59	0.56	0.36	0.37	0.25*
Order & Organization	0.95	0.94	0.74	0.74	0.40	0.43	0.39*
Rule Clarity	0.90	0.84	0.66	0.63	0.38	0.43	0.19*
	(Sample: 116 Grade 8 and 9 classes)						
My Class Inventory (MCI) (Elementary school level)							
Cohesiveness	0.97	-	0.81	0.78	0.25	0.30	0.28*
Friction	0.91	-	0.78	0.82	0.27	0.34	0.33*
Difficulty	0.91	-	0.58	0.60	0.31	0.31	0.15*
Satisfaction	0.94	-	0.68	0.75	0.30	0.38	0.23*
Competitiveness	0.95	-	0.70	0.77	0.11	0.32	0.15*
	(Sample: 32 Grade 3 classes, except for first column which is based on 100 Grade 7 classes)						

* $p<0.01$

one-way ANOVA with class membership as the main effect and using the individual as the unit of statistical analysis. The results of these analyses are shown in the last column of Table II and indicate that the short form of the actual version of each of the 11 scales differentiated significantly ($p<0.01$) between the perceptions of students in different classrooms. The eta^2 statistic, which is the ratio of between to total sums of squares, is provided as an estimate of the amount of variance in classroom environment scores attributable to class membership.

PSYCHOSOCIAL ENVIRONMENT IN EXEMPLARY TEACHERS' CLASSROOMS

As space does not permit consideration of the classroom environment data for each class and each exemplary teacher in the overall study, two examples are reported below to illustrate some of the typical patterns which emerged across numerous sites. The first example below involves use of the short form of the MCI in a comparison of the actual environment of an exemplary elementary teacher's class with the mean for a large comparison group of elementary teachers. The second example below involves the use of both the actual and preferred forms of the short version of the CES in a comparison of the actual environment of an exemplary Grade 11 biology class with, first, the environment preferred by that class of students and, second, the actual environment of a comparison group of classes.

Exemplary Elementary Science Classes

In a case study of exemplary elementary science teaching, two teachers referred to as Miss East and Mr West were observed. Miss East was teaching a composite class of Grade 5 and 6 students in a small school, which has just over 200 students mainly of lower socioeconomic status and relatively old but reasonably comfortable accommodation. In contrast, Mr West was teaching a composite class of Grade 3 and 4 students in a large modern school with an enrolment of approximately 600 students predominantly from middle-class backgrounds. At the time of the study, Miss East had had five years of teaching experience and Mr West had had 10 years of teaching experience. Both teachers were committed to "hands on" science teaching. The classroom layout was more formal in Mr West's room, with students sitting in rows facing the blackboard, than in Miss East's room, where students were seated in groups along the perimeter of the room. It was thought that these two exemplary teachers would make an interesting basis for an examination of the classroom climates in exemplary elementary teachers' classes.

Classroom observations over numerous lessons built up a tentative picture of some aspects of Miss East's and Mr West's classroom practice. Both teachers' lessons usually were somewhat formal and structured in that the teacher expected all students to be seated and paying attention during teacher-centred activities, all students were engaged in similar tasks at any given time, and each lesson had the same pattern (namely, whole-class oral activity, followed by individual or group work, followed by whole-class reporting and discussion). Both teachers had efficient methods for organizing science equipment and materials and making them available at the commencement of the class (although Mr West often gave students the responsibility of bringing pertinent materials for practical activities from home). In terms of written work, Mr West's students usually were responsible for maintaining their own records in their

science note books, whereas students in Miss East's class typically used prepared worksheets.

The 31 students (15 girls and 16 boys) in Miss East's class and the 32 students (16 girls and 16 boys) in Mr West's class responded to the actual form of the MCI. Table III lists the mean score obtained by each exemplary class on each of the MCI's five scales. As well, for comparison purposes, Table III also shows the mean and standard deviation (using the class mean as the unit of analysis) for a comparison group consisting of the sample of 32 Grade 3 classes described previously in this paper. Table III also expresses the differences between the exemplary classrooms and the control group in terms of the number of standard deviations (i.e., effect sizes). For example, the interpretation of the effect size of 1.3 for the Satisfaction scale for Miss East's class is that her class mean was 1.3 standard deviations higher than the grand mean of the comparison group.

It is noteworthy that students in each of the exemplary classrooms perceived their class environments markedly more favourably than the way the comparison group viewed their classes on several of the MCI's scales. Relative to the comparison group, Miss East's students perceived their class as having much more Satisfaction (1.3 standard deviations), less Friction (1.6 standard deviations), and Difficulty (1.1 standard deviations). Mr West's class, relative to control classes, was perceived as having markedly more Satisfaction (2.8 standard deviations), less Friction (1.9 standard deviations), Competitiveness (1.3 standard deviations), and less Difficulty (1.8 standard deviations). These results are depicted graphically in Figure 1 which shows the profile of mean actual environment scores for each exemplary teacher and for the comparison group.

The fact that less Difficulty was perceived by students in classes of exemplary teachers does not necessarily mean that tasks were less complex. Rather, exemplary teachers could have taken certain initiatives which supported students and made potentially complex material appear easier. Possible explanations as to why Miss East's class had a less favourable perceived environment than Mr West's class are, first, that her class drew students from a lower socioeconomic catchment area and, second, that her classroom was undergoing building and maintenance work during the time of the study.

Exemplary Senior High School Biology Class

In the previous paper in this symposium (Treagust, 1986), details were provided from a case study of exemplary practice in several classes taught by senior high school biology teachers. This section examines the classroom environment as perceived by the Grade 11 biology students of the teacher identified by Treagust as PH. This group of 14 students responded to both the actual and the preferred versions of the six scales in the short form of the CES. In addition to comparing the actual environment of the exemplary class with a comparison group, an examination was also made of the extent to which the actual environment of the exemplary class approximated the students' preferred environment.

TABLE III

Normative Data (Mean, SD) for Actual Form of Short Version of My Class Inventory and Means for Classes of Two Exemplary Elementary Science Teachers

Scale	Normative Sample[a]		Exemplary Classes			
			Miss East		Mr West	
	Mean	SD	Mean	Effect Size[b]	Mean	Effect Size
Satisfaction	11.3	1.2	12.9	1.3	14.6	2.8
Friction	11.3	1.8	8.4	-1.6	7.8	-1.9
Competitiveness	12.9	1.0	12.7	-0.2	11.6	-1.3
Difficulty	7.5	0.9	6.5	-1.1	5.9	-1.8
Cohesiveness	9.8	1.8	11.2	0.7	12.4	1.4

a Normative sample consists of 32 Grade 3 classes and the class is used as the unit of analysis.

b Effect size is defined as the difference between the means of the exemplary class and the normative sample divided by the standard deviation of the normative group.

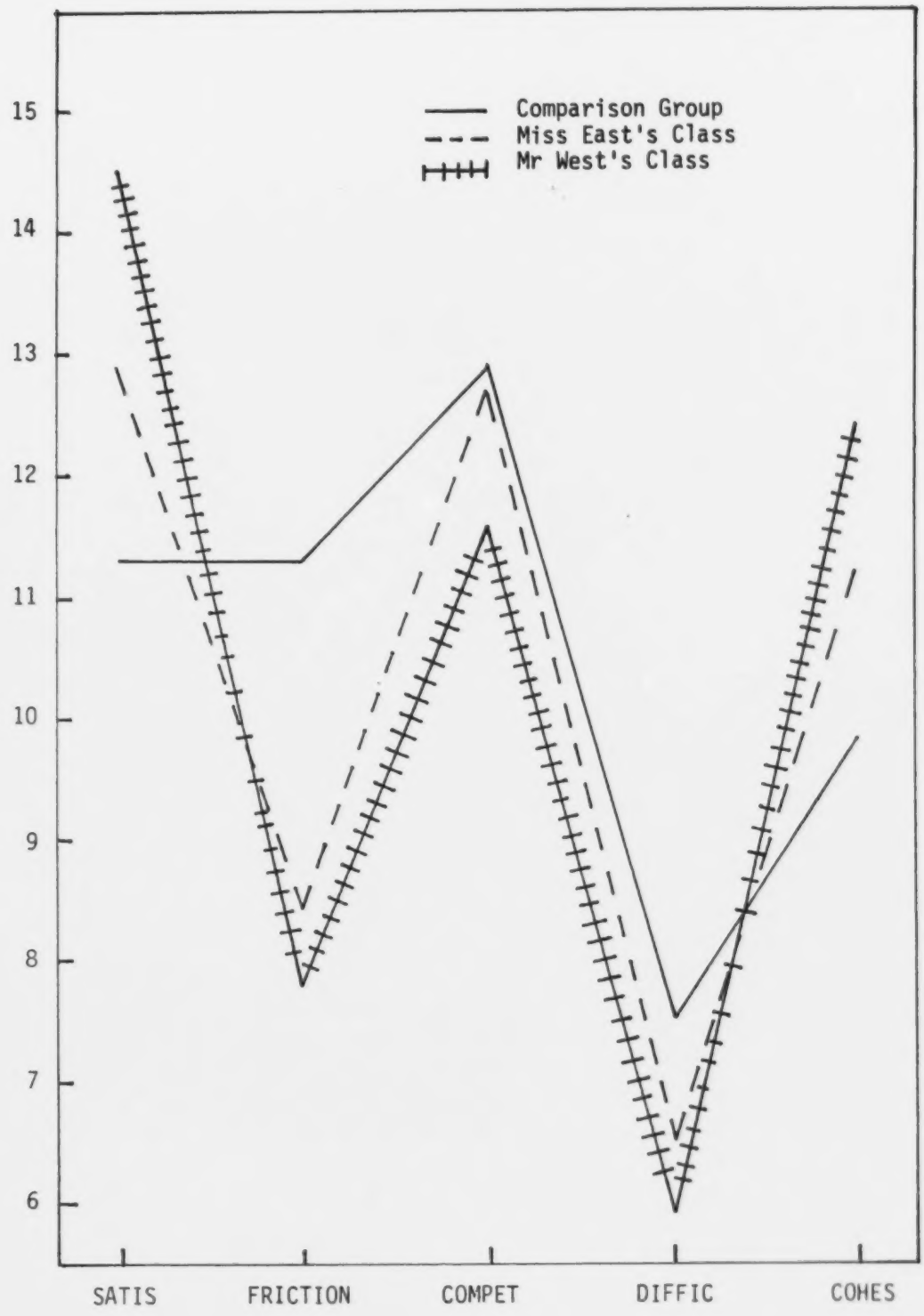

FIGURE 1: Actual Classroom Environment Profiles for Two Exemplary Elementary Teachers and a Comparison Group

PH is male, had completed 11 years of teaching at the time of the study, and is the senior teacher in charge of biology at his school. His Grade 11 biology students (five male and nine female) come from middle to lower socioeconomic backgrounds and his school is a public high school. The biology curriculum followed is an Australian adaptation of BSCS. For practical work and discussion groups, students tended to choose to work in single-sex groups. Classroom observations suggested that PH has exceptional classroom management skills, is a good leader in discussions, gets on very well with students and encourages students to ask questions.

Just as Figure 1 depicted differences between the environments of some exemplary elementary classes and a comparison group, Figure 2 provides an analogous graphical illustration of differences between the environment of PH's Grade 11 biology class and a comparison group consisting of the 116 junior high school science classes described earlier in this paper. It is clear from Figure 2 that students of the exemplary biology teacher perceived their actual class climate considerably more favourably than the way that the comparison group viewed their science classes. The biggest differences (which were in excess of a standard deviation for class means) occurred for Involvement, Teacher Support and Order and Organization. That is, while PH's students perceived a more favourable classroom environment on all dimensions assessed by the CES, these differences were most marked in terms of the high levels of Involvement, Teacher Support and Order and Organization.

Another way of interpreting the classroom environment data involves a comparison of the actual environment of the exemplary teacher's biology class with that class's preferred classroom environment. Past research evidence from both science and non-science classes (Moos, 1979; Fisher & Fraser, 1983; Fraser, 1984) clearly indicates a pattern in which students' preferred classroom environment is consistently more positive than the environment perceived to be actually present. Consequently, Figure 2 depicts a quite atypical classroom where there is a congruence between actual and preferred environment on as many as five of the CES's dimensions. The only exception to this pattern is that students would prefer more Teacher Support (even though the level of Teacher Support in PH's classroom is much higher than the mean of a comparison group). Consequently, the comparison of actual and preferred environment as perceived by students in the exemplary class provides further evidence about the favourableness of the classroom environment created by this exemplary biology teacher.

CONCLUSION

This paper examined the classroom environment of two classes taught by exemplary elementary science teachers and of one class taught by an exemplary biology teacher. In an attempt to make meaningful interpretations of the data, the actual environments of exemplary teachers' classes were compared with the actual environment of a control group of classes and with the preferred class environment as perceived by the students of one of the exemplary teachers. Overall the results reported in this paper, when considered in conjunction with other analogous findings not reported from the Exemplary Practice in Science and Mathematics study, suggest that exemplary and ordinary science

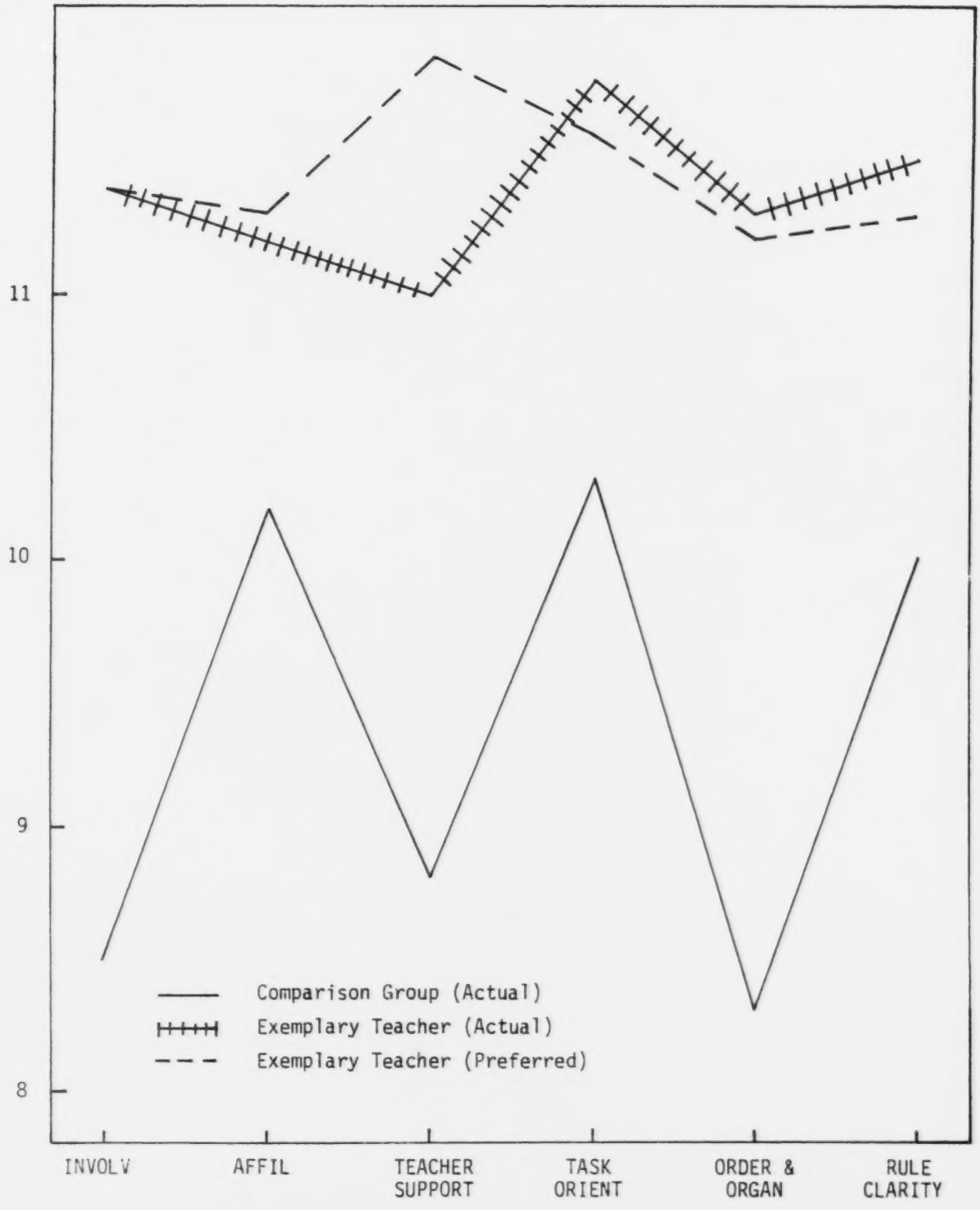

FIGURE 2: Profiles of Actual and Preferred Classroom Environment Scores for an Exemplary Biology Teacher and Actual Environment Scores for a Comparison Group

teachers can be differentiated in terms of the psychosocial environments of their classrooms.

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The data presented in this paper on the classroom psychosocial environment of exemplary science teachers was taken from drafts of case studies written by Trevor Lacy (elementary school level) and David Treagust (senior high school level).

References

Chavez, R.C. (1984) The use of high inference measures to study classroom climates: A review. Review of Educational Research, 54, 237-261.

Fisher, D.L., & Fraser, B.J. (1981) Validity and use of My Class Inventory. Science Education, 65, 145-156.

Fisher, D.L., & Fraser, B.J. (1983) Validity and Use of Classroom Environment Scale. Educational Evaluation and Policy Analysis, 5, 261-271. (a)

Fisher, D.L., & Fraser, B.J. (1983) A comparison of actual and preferred classroom environments as perceived by science teachers and students. Journal of Research in Science Teaching, 20, 55-61. (b)

Fraser, B.J. (1981) Learning environment in curriculum evaluation: A review. "Evaluation in Education" series, Oxford: Pergamon.

Fraser, B.J. (1985) Two decades of research on classroom psychosocial environment. In B.J. Fraser (Ed.), The Study of Learning Environments 1985. Salem, Oregon: Assessment Research.

Fraser, B.J. (1986) Classroom environment. London: Croom Helm.

Fraser, B.J. (1984) Differences between preferred and actual classroom environment as perceived by primary students and teachers. British Journal of Educational Psychology, 54, 336-330.

Fraser, B.J., Anderson, G.J., & Walberg, H.J. (1982) Assessment of learning environments: Manual for Learning Environment Inventory (LEI) and My Class Inventory (MCI). Perth: Western Australian Institute of Technology.

Fraser, B.J., & Fisher, D.L. (1982) Predicting students' outcomes from their perceptions of classroom psychosocial environment. American Educational Research Journal, 19, 498-518. (a)

Fraser, B.J., & Fisher, D.L. (1982) Predictive validity of My Class Inventory. Studies in Educational Evaluation, 8, 129-140. (b)

Fraser, B.J., & Fisher D.L. (1983) Use of actual and preferred classroom environment scales in person-environment fit research. Journal of Educational Psychology, 75, 303-313. (a)

Fraser, B.J., & Fisher, D.L. (1983) Development and validation of short forms of some instruments measuring student perceptions of actual and preferred classroom learning environment. Science Education, 67, 115-131. (b)

Fraser, B.J., & O'Brien, P. (1985) Student and teacher perceptions of the environment of elementary-school classrooms. Elementary School Journal. (in press)

Harty, H., & Hassan, H.A. (1983) Student control ideology and the science classroom environment in urban secondary schools of Sudan. Journal of Research in Science Teaching, 20, 851-859.

Lawrenz, F.P., & Munch, T.W. (1984) The effect of grouping of laboratory students on selected educational outcomes. Journal of Research in Science Teaching, 21, 699-708.

Moos, R.H. (1974) The Social Climate Scales: An overview. Palo Alto, Calif: Consulting Psychologists Press.

Moos, R.H. (1979) Evaluating educational environments: Procedures, measures, findings and policy implications. San Francisco: Jossey-Bass.

Moos, R.H., & Trickett, E.J. (1974) Classroom Environment Scale manual. Palo Alto, Calif.: Consulting Psychologists Press.

Talmage, H., & Walberg, H.J. (1978) Naturalistic decision-oriented evaluation of a district reading program. Journal of Reading Behavior, 10, 185-195.

Tobin, K.G. (1986) Exemplary practice in science classrooms. Paper presented at Annual Meeting of National Association for Research in Science Teaching, San Francisco, March 1986.

Treagust, D.F. Exemplary practice in biology classes. Paper presented at Annual Meeting of National Association for Research in Science Teaching, San Francisco, March 1986.

Trickett, E.J. (1978) Toward a social-ecological conception of adolescent socialization: Normative data on contrasting types of public school classrooms. Child Development, 49, 408-414.

Trickett, E.J., & Moos, R.H. (1973) Social environment of junior high and high school classrooms. Journal of Educational Psychology, 65, 93-102.

Trickett, E.J., Trickett, P.K., Castro, J.J., & Schaffner, P. (1982) The independent school experience: Aspects of normative environments of single sex and coed secondary schools. Journal of Educational Psychology, 74, 374-381.

Walberg, H.J. (1979) (Ed.) Educational environments and effects: Evaluation, policy, and productivity. Berkeley, Calif.: McCutchan.

CLASSROOM ENVIRONMENT SCALE

ACTUAL SHORT FORM

DIRECTIONS

This questionnaire contains statements about practices which could take place in this classroom. You will be asked how well each statement describes what your class is actually like.

There are no 'right' or 'wrong' answers. Your opinion is what is wanted.

Think about how well each statement describes what your actual classroom is like. Draw a circle around

True if it is TRUE or MOSTLY TRUE that the practice actually takes place;

False if it is FALSE or MOSTLY FALSE that the practice actually takes place.

Be sure to give an answer for all questions. If you change your mind about an answer, just cross it out and circle another.

Some statements in this questionnaire are fairly similar to other statements. Don't worry about this. Simply give your opinion about all statements.

NAME _____ SCHOOL _____ CLASS _____

Remember you are describing your actual classroom	Circle Your Answer	Teacher Use Only	Remember you are describing your actual classroom	Circle Your Answer	Teacher Use Only
1. Students put a lot of energy into what they do here.	(True) False	3	13. Students are often "clockwatching" in this class.	True (False)	R 3
2. Students in this class get to know each other really well.	True False		14. A lot of friendships have been made in this class.	True False	
3. This teacher spends very little time just talking with students.	True False	R	15. The teacher is more like a friend than an authority.	True False	
4. We often spend more time discussing outside student activities than class-related material.	True False	R	16. Students don't do much work in this class.	True False	R
5. This is a well-organized class.	True False		17. Students fool around a lot in this class.	True False	R
6. There is a clear set of rules for students to follow.	True (False)	1	18. The teacher explains what will happen if a student breaks a rule.	True False	2
7. Students daydream a lot in this class.	(True) False	R 1	19. Most students in this class really pay attention to what the teacher is saying.	(True) (False)	2
8. Students in this class aren't very interested in getting to know other students.	True False	R	20. It's easy to get a group together for a project.	True False	
9. The teacher takes a personal interest in students.	True False		21. The teacher goes out of his/her way to help students.	True False	
10. Getting a certain amount of classwork done is very important in this class.	True False		22. This class is more a social hour than a place to learn something.	True False	R
11. Students are almost always quiet in this class.	True False		23. This class is often very noisy.	True False	R
12. Rules in this class seem to change a lot.	(True) False	R 1	24. The teacher explains what the rules are.	(True) False	3

I 9 A____ TS____ TO____ OO____ RC 7

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MY CLASS INVENTORY

ACTUAL SHORT FORM

DIRECTIONS

This is not a test. The questions inside are to find out what your class is actually like.

Each sentence is meant to describe what your actual classroom is like. Draw a circle around

Yes if you AGREE with the sentence
No if you DON'T AGREE with the sentence

EXAMPLE

27. Most children in our class are good friends.

If you agree that most children in the class actually are good friends, circle the Yes like this:

(Yes) No

If you don't agree that most children in the class actually are good friends, circle the No like this:

Yes (No)

Please answer all questions. If you change your mind about an answer, just cross it out and circle the new answer.

Don't forget to write your name and other details on the top of the next page.

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NAME _____ SCHOOL _____ CLASS _____

Remember you are describing your actual classroom	Circle Your Answer	Teacher Use Only	Remember you are describing your actual classroom	Circle Your Answer	Teacher Use Only
1. The pupils enjoy their schoolwork in my class.	(Yes) No	3	16. Some of the pupils don't like the class.	Yes (No)	R 3
2. Children are always fighting with each other.	Yes No		17. Certain pupils always want to have their own way.	Yes No	
3. Children often race to see who can finish first.	Yes No		18. Some pupils always try to do their work better than the others.	Yes No	
4. In our class the work is hard to do.	Yes No		19. Schoolwork is hard to do.	Yes No	
5. In my class everybody is my friend.	Yes (No)	1	20. All of the pupils in my class like one another.	(Yes) No	3
6. Some pupils are not happy in class.	(Yes) No	R 1	21. The class is fun.	Yes No	2
7. Some of the children in our class are mean.	Yes No		22. Children in our class fight a lot.	Yes No	
8. Most children want their work to be better than their friend's work.	Yes No		23. A few children in my class want to be first all of the time.	Yes No	
9. Most children can do their schoolwork without help.	Yes No	R	24. Most of the pupils in my class know how to do their work.	Yes No	R
10. Some people in my class are not my friends.	Yes (No)	R 3	25. Children in our class like each other as friends	(Yes) No	3
11. Children seem to like the class.	Yes (No)	1			
12. Many children in our class like to fight.	Yes No				
13. Some pupils feel bad when they don't do as well as the others.	Yes No				
14. Only the smart pupils can do their work.	Yes No				
15. All pupils in my class are close friends.	(Yes) (No)	2			

S 10 F ___ Cm ___ D ___ Ch 12